TOWARDS HORIZON EUROPE:

EUROPEAN GNSS
DOWNSTREAM RESEARCH & INNOVATION, PRIORITIES AND CONSULTATION RESULTS

GALILEO EGNOS
NAVIGATION MADE IN EUROPE

European Global Navigation Satellite Systems Agency

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INTRODUCTION

SCOPE

This note summarises the proposed European GNSS (EGNSS) **downstream funding priorities and funding tools, for the years 2021-2027**, aimed at supporting EGNSS market uptake, the active use of EGNOS and Galileo in applications and receivers, the competitiveness of EU industry and the creation of new businesses. This proposal is based on the experience gained during current downstream Research and Innovation (R&I) programmes (e.g., H2020 Galileo applications and Fundamental Elements), on an analysis of what will change both in the market and in the status of the European GNSS after 2020, and on the key inputs received by users and stakeholders from the entire value chain. This approach has been **discussed and endorsed by stakeholders** during a series of consultations:

- discussions with stakeholders during the User Consultation Platform (November 2017 and December 2018)
- Administrative Board Workshops (AB 49 in June 2017, AB 52 in March 2018)
- consultations with the Member States (AB 55 in January 2019)
- consultations with industry and academia (June 2019)

The consultation process was concluded on 13 September 2019 during the H2020 Space Info Day in Prague.

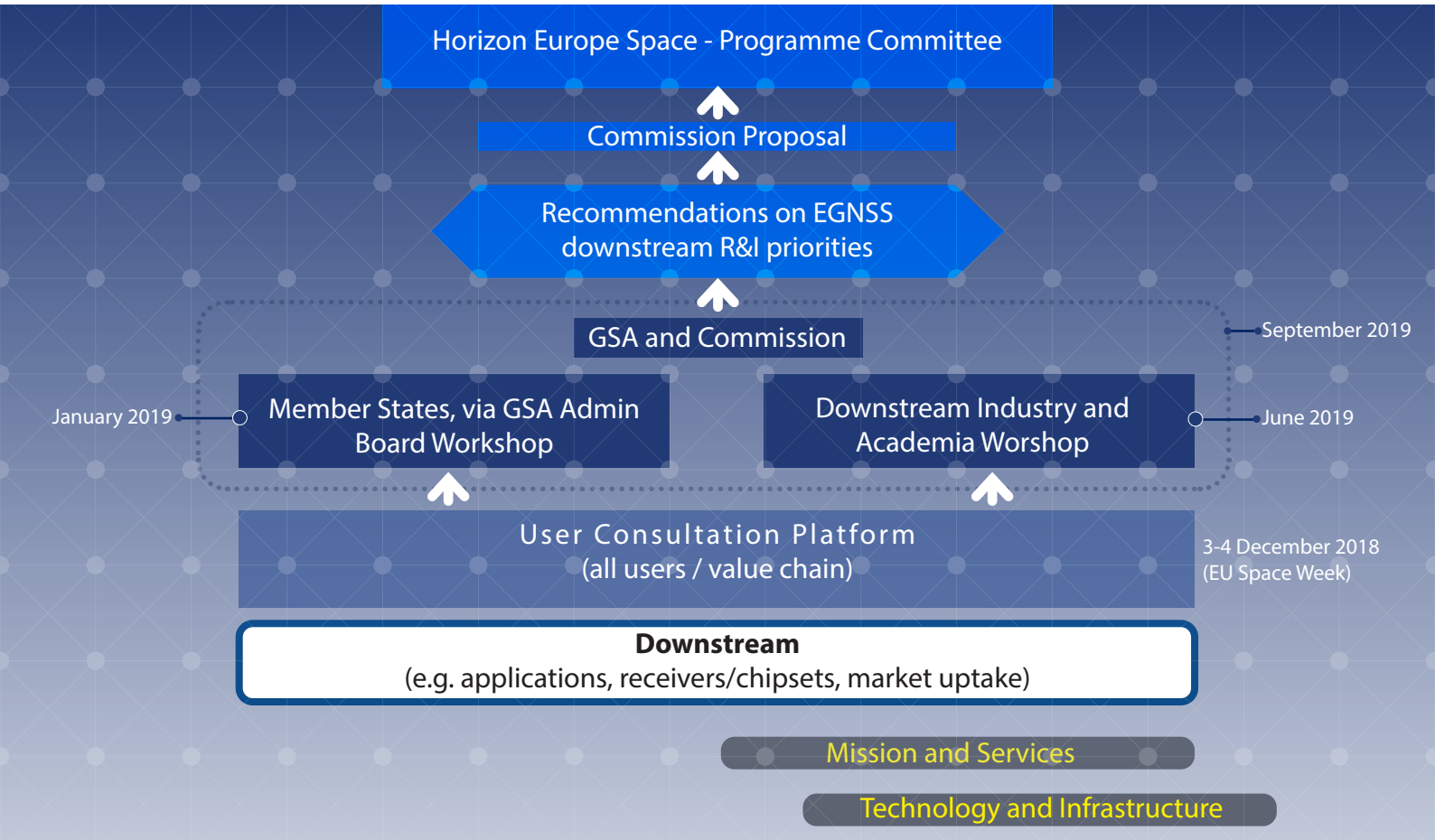


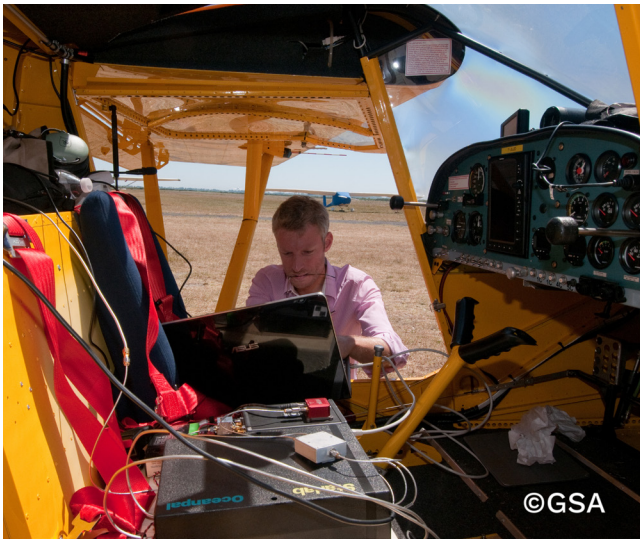
Figure 1: EGNSS Downstream: Horizon Europe consultation process

CURRENT SITUATION

The European space economy (upstream, mid-stream and downstream) is estimated to employ over 230,000 professionals generating a value of EUR 46-54 billion or 21% of the global value of the sector[1]. The downstream sector is, in particular, a sector where new jobs are created thanks to the increasing volumes of satellite data available for exploitation by innovative applications. Today, the GNSS market represents more than 50,000 jobs in the European downstream market. Also it is estimated that currently over 10% of European GDP is enabled by economic activities linked to the need for location through satellite navigation systems, including European GNSS (Galileo and EGNOS)[2]. This number will continue to grow, i.e. global GNSS downstream market revenues from both devices and services will grow from EUR 150 bln in 2019 to EUR 325 bln in 2029 with a CAGR of 8%[3].

The GNSS downstream sector primarily relates to GNSS applications, receivers and devices that are using the data provided by space infrastructure. Today GNSS is used in a variety of industries, ranging from transport and precision agriculture to simple car navigation.

The European space infrastructures are built and operational. The EU has achieved a great success by ensuring the continuity of space services based on these infrastructures, working every day with users and companies, contributing to create a dynamic downstream sector that now needs to grow and succeed internationally. The European GNSS downstream market generated more than EUR 38 bln revenues in 2019. The United States continues to lead the global GNSS market (at 28% of total industry revenues), however Europe is closing the gap with the United States, accounting for 27% of total industry revenues (compared to 25% in 2015)[4].



Horizon Europe should build on this positive trend achieved via H2020 and FP6-7, leveraging space data to build applications that integrate the various EU space programme services, stimulating entrepreneurship and creating new jobs. During recent years, the European GNSS Agency (GSA), delegated by the European Commission, has applied a market-oriented approach to innovation in downstream applications, being **a pioneer in introducing business plans** at proposal level and **business coaching** during the projects. Another innovation has been the use of Research and Innovation (R&I) as an essential tool for the market uptake of EGNOS and Galileo, as a coherent part of its adoption strategy. This has proved to be a major factor for success, as confirmed by the European GNSS mid-term review and by the market results. In order to be able to bring benefits to European citizens, it is indispensable that the receivers of all focal markets are ready for Galileo. This is where the Fundamental Elements[5] programme comes into play, ensuring receiver readiness. Overall, thanks to the successful implementation of FP7, H2020 and Fundamental Elements, the GSA supported the build-up of a portfolio of products and advanced prototypes in European industry, and contributed to ensuring a strong European downstream competence in GNSS, increasing especially the role of SMEs and contributing to the creation of start-ups.

As revealed by users during the User Consultation Platform 2017 and the User Consultation Platform 2018, in order to make the space sector competitive, R&D investment should be substantially focused on the downstream domain, increasing the use of space signals and data, leveraging the differentiators of the EU Space Programmes with the aim of improving the worldwide market share of EU downstream industry and SMEs.

[1]Socio-economic impacts from Space activities in the EU in 2015 and beyond, PWC study, 2016.
[2]*Analysis of GNSS impact on the EU Economy, November 2016.*
[3]GSA GNSS Market Report 2019, Issue 6
[4]GSA GNSS Market Report 2019, Issue 6
[5]See Article 7(2) of the EGNSS Regulation (EU) No. 1285/2013

OPPORTUNITIES AHEAD

The Space Strategy for Europe[6] recognized that 'investments in downstream space developments are necessary to demonstrate the important role of space in achieving the key objectives of EU policies'. Horizon Europe should foster the market uptake of the EU space programmes (e.g. EGNOS and Galileo) through: boosting demand among public and private users, facilitating access to and use of space services, and stimulating the development and use of innovative downstream applications.

As described above, the current European EGNSS market share is 27%, while the usual European market share in other high-tech sectors reaches 33%. Europe's objective is to increase the EGNSS market share to 30% by 2025. In order to do that, there is a strong need for institutional support to provide the European GNSS downstream industry with the means to become even more competitive in the global market, as due to both high market and technology risks, market forces alone will not cover the whole spectrum of possibilities offered and opportunities will be lost. Between 2014 and 2020 the EU has invested around EUR 8 bln in EGNSS infrastructure, while investments in the development of value-added applications and services, receivers and market uptake reached around EUR 300 million (Horizon Europe and Fundamental Elements).

the development of downstream and applications[7]". While the market uptake of European GNSS will be achieved in many areas by 2020, **important priorities will still remain** such as the adoption in the longer term market segments and the proper use of Galileo, positioning it as a worldwide leader, in particular:

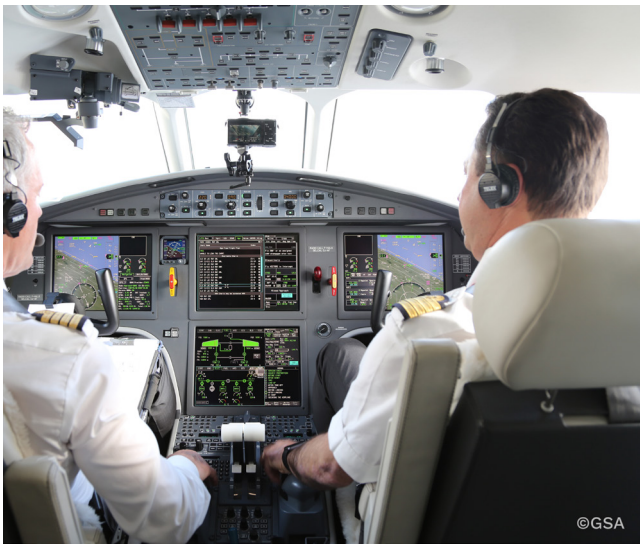
- Complete market uptake **in longer term regulated market segments** (e.g. Galileo for rail, aviation, autonomous cars)
- Position **Galileo as a leader** in segments where its unique features/differentiators make a difference
- Support the **Public Sector as a customer** of Galileo
- Foster competitiveness of EU downstream industry and **SMEs/start-ups** and leverage regional competences

From the downstream industry and SME perspective, the European Commission and the GSA contributed to creating and maintaining the GNSS downstream sector in Europe. After 2020, when the GNSS community will count on the full availability of the Galileo differentiators, a further effort will be required to translate these differentiators into enhanced competitiveness.

NEW NEEDS AFTER 2020

After 2020, when the Galileo system is fully operational and the new version of EGNOS will start to be deployed, the primary goal will be to establish European GNSS as the leader in those markets and sectors that best exploit the unique differentiators of the systems.

This was also the conclusion of the European Commission interim report on the implementation of the Galileo and EGNOS programmes and on the performance of the GSA: "The stakeholder consultation identified a need, for the next phase of the Galileo programme, to shift the focus from the deployment and operation of the infrastructure to



[6] COM(2016) 705 final
[7] SWD(2017) 346 final, Commission Staff Working Document Interim Evaluation of Galileo and EGNOS programmes and evaluation of the European GNSS Agency accompanying the document Report from the Commission to the European Parliament and the Council on the implementation of the Galileo and EGNOS programmes and on the performance of the European GNSS Agency

EGNSS DOWNSTREAM IN HORIZON EUROPE AND SPACE REGULATION - BROAD LINES OF ACTIVITY

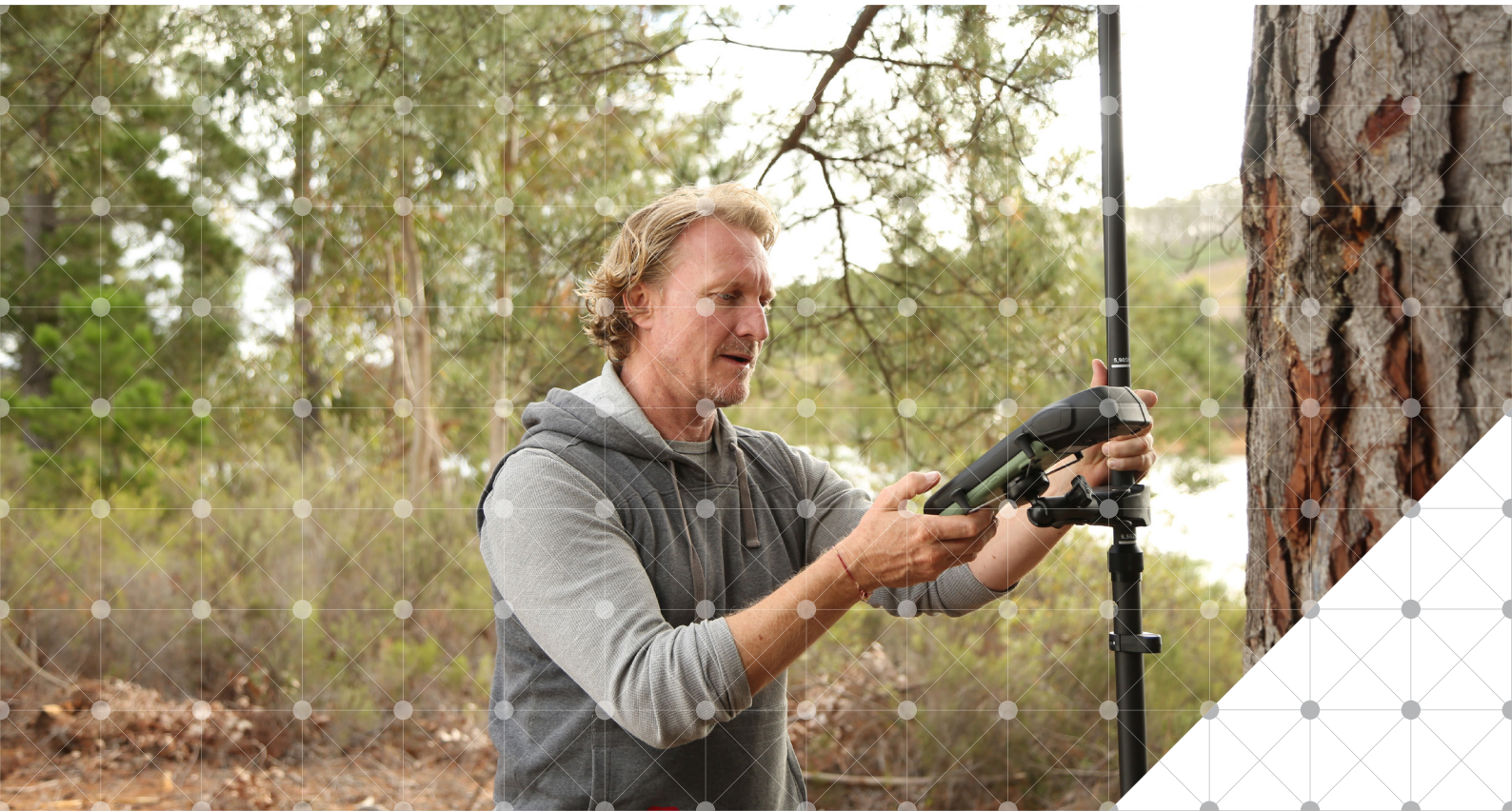
1. GRANTS AND FUNDAMENTAL ELEMENTS TO COMPLETE MARKET UPTAKE AND POSITION GALILEO AS A LEADER

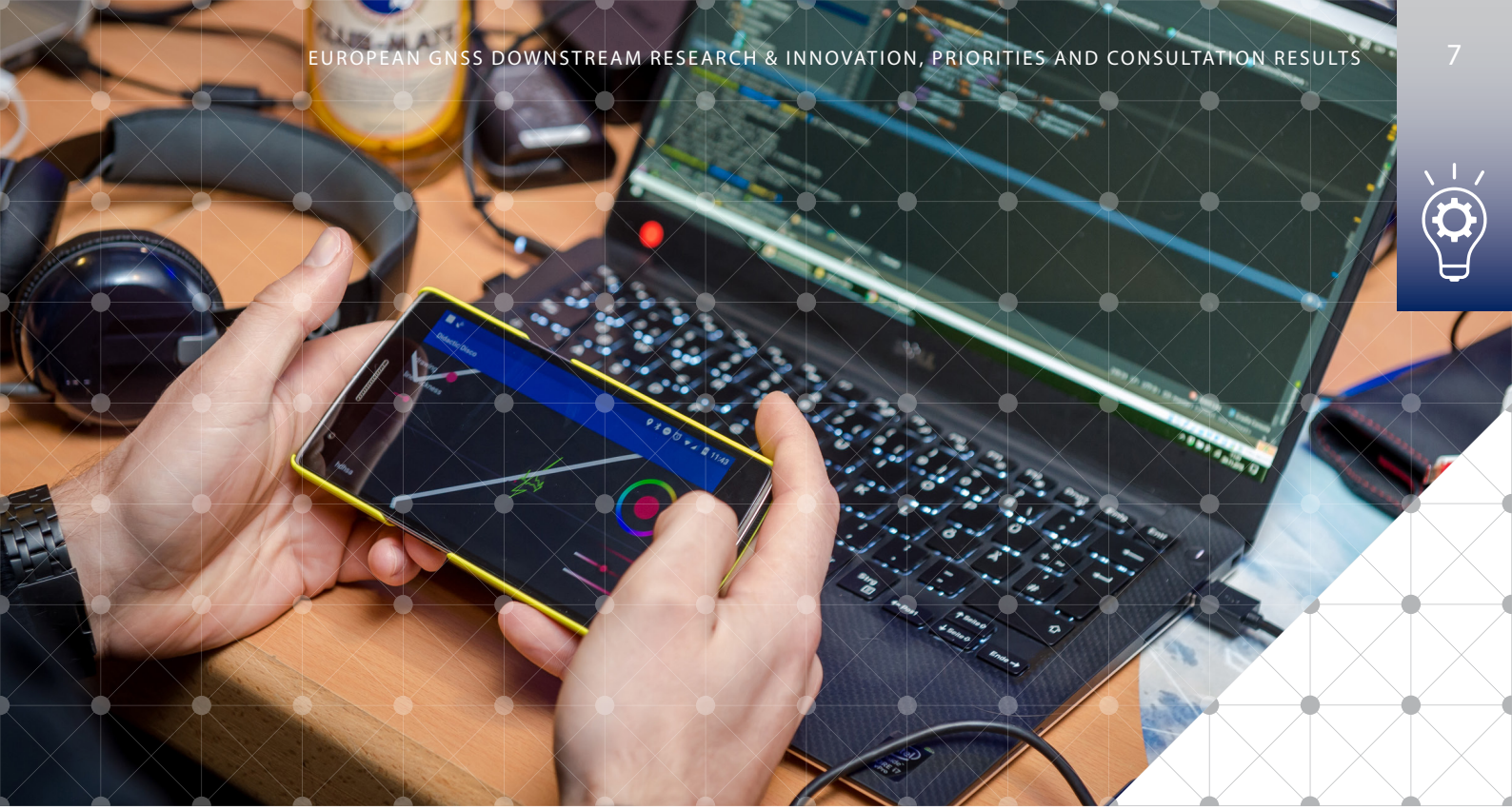
Downstream R&I activities should continue their focus on the development of close-to-market EGNSS applications in the areas of transport, mass market applications and professional applications, thereby increasing knowledge and cross-border cooperation in these areas, and delivering on EU strategic challenges such as climate change, digitalisation, environmental protection, etc. Particular attention should be given to new market trends such as unmanned automated and connected vehicles, Internet of Things, Artificial Intelligence, robotics, etc., thus accelerating industrial transformation. The R&D priorities should therefore include solutions that support the circular economy, leveraging GNSS to limit the environmental impact of transport and support precision agriculture.

At the same time, Horizon Europe should devote a significant part of the investments to completing the downstream EGNSS adoption in the longer-term regulated market segments e.g. through the realisation of large implementation projects.

In both of these areas, a special focus should also be placed on the uptake of new EGNSS services/differentiators, such as the High Accuracy Service, Galileo Authentication features and the Search and Rescue Return Link, thereby spreading and connecting excellence across Europe.

This is also an area where the Fundamental Elements Programme is needed in order to accelerate the uptake of EGNSS differentiators by end users, by anticipating receiver capabilities supporting these differentiators. This will be essential for when the differentiators will emerge from the testing and validation phases to full service provision in order to ensure market readiness across all segments. Taking into account that the further evolution of the Galileo and EGNOS systems will also require the development of fundamental elements such as commercial chipsets, receivers and antennas in Europe, Horizon Europe should support these developments and open the way for new and innovative missions, concepts, services and applications. Furthermore, synergies with other technologies, e.g. COPERNICUS and 5G, should be sought through EGNSS innovations.





2. AWARENESS RAISING/ CAPACITY BUILDING AND INTERNATIONAL COOPERATION TO INCREASE THE DOWNSTREAM COMPETITIVENESS IN INTERNATIONAL MARKETS

The R&D funds should provide support to awareness raising and capacity building initiatives in the field of EGNSS, which is an essential element in facilitating the breakthrough of EGNOS and Galileo inside and outside Europe, thereby strengthening international R&D cooperation in this area. International cooperation actions shall focus on supporting the establishment of new EGNSS/space downstream opportunities for European industries and SMEs/start-ups through participation in global value chains and access to new and emerging markets.

3. DOWNSTREAM APPLICATIONS INVOLVING SEVERAL COMPONENTS OF THE SPACE PROGRAMME

Space technologies, data and services have become indispensable in the daily lives of European citizens. Space-based downstream solutions are providing a huge impact and benefits in areas like energy, food, health, maritime surveillance, security, water management, and transport. On top of the development of applications focused on a single space programme, there is an opportunity to create applications across all space components that will facilitate synergies between space solutions and further push market adoption, while ensuring a return on investment.

Horizon Europe should support the development of close to market integrated space based downstream applications that focus on synergies between space systems/technologies, e.g. EGNSS and Copernicus. The solutions should be user-driven and focus on the following areas:

- Transport
- Agriculture and Forestry
- Ocean Monitoring
- Urban Planning and Geomatics
- Critical Infrastructures
- Environment and air quality
- Natural Disasters and Emergency Response
- Insurance and Finance
- Governmental and Security

Activities within this action should focus on the development of close-to-market solutions (TRL7) exploiting at least two space systems/technologies. The funding should be split into two stages: the first stage should cover the technological development of solutions and preliminary tests, the second stage funding should be dedicated to the implementation of large pilot projects and the demonstration/validation of developed solutions with potential customers involved.

4. INNOVATION PROCUREMENT TO FOSTER PUBLIC SECTOR AS GALILEO CUSTOMER

Horizon Europe should also support public stakeholder needs through specific funding tools enabling the development (PCP) and deployment (PPI) of innovative EGNSS solutions. EGNSS focused innovation procurement (PCP and PPI) aims to bring national, regional and local public bodies to cooperate with their peers in other EU countries interested in EGNSS-based solutions. This cooperation should speed up public sector modernisation in a more coherent way and help improve the quality and efficiency of public services. It would also make it possible to obtain better value for money through cooperation and allow the public sector around Europe to share the cost and the experiences of EGNSS innovative solutions. Moreover, joint efforts can help overcome similar challenges faced by the public sector in different areas around Europe.

5. SPACE-BASED ENTREPRENEURSHIP TO INCREASE DOWNSTREAM COMPETITIVENESS FOCUSING ON ENTREPRENEURS/ START-UPS/SMES

The Space Regulation calls for the creation and scale-up of innovative SMEs. This need should be addressed through a competitive space start-ups for innovation programme aiming at the promotion, development, incubation and upscaling (including support to Venture Capital activities) of start-ups across all space application areas.

The promotion, development, incubation and upscaling of start-ups across all space application areas could be fostered through a horizontal activity cross-cutting all the EU space components.

This cross-cutting and horizontal activity should be comprehensive in order to: expand the number of start-ups in the EU, building businesses based on innovative EU space technologies (i.e. expand a 'space ecosystem'); increase their chances to succeed (with both technical and managerial support); accelerate/secure their growth and scale up (attracting more private investors).

It should consolidate and streamline a patchwork of existing innovation and start-up support initiatives and funding programmes to create a coherent, long-term (2021-2027), structured, focused and scalable public support mechanism.

The initiative would aim to achieve an increase in the number of space-based start-ups to become SMEs in the EU, the expansion of their sales, profit and employment levels. Start-ups/SMEs based on space technologies generate high value added activities in technology intensive sectors that can further enhance the competitiveness of the EU economy.

Such an initiative should also mobilise co-funding at Member State level, from both public and local private partners. Implementation of EGNSS downstream entrepreneurship programme should be strongly linked to Horizon Europe activities, which will also give a boost to start-ups in Europe.

5 a. A part of such an initiative should be focused on Support to Venture Capital and other funding tools supporting EGNSS business creation.

In the context **of EGNSS, the activities would be aimed at facilitating access to finance for EU GNSS downstream companies. The aim is not to create a dedicated fund but rather to work with existing Venture Capital funds/initiatives and also EIB/EIF instruments to:**

- Raise the knowledge of GNSS, and especially of EGNSS potential
- Establish cooperation with existing funds, acting as a facilitator for companies and providing technical support to evaluate projects to be funded

6. EGNSS EXCELLENCE CENTRES/ SPACE HUBS TO LEVERAGE REGIONAL COMPETENCES ATTRACTING PRIVATE AND LOCAL FUNDS

The development of a favourable EGNSS ecosystem should be further facilitated through the involvement of EGNSS Centres of Excellence (CoE), either as standalone facilities or being part of possible future space hubs that can provide impetus for new business initiatives. The Space Strategy for Europe underlines the need to encourage a business and innovation-friendly ecosystem at the European, regional and national levels by establishing space hubs that bring together the space, digital and user sectors. This initiative could be part of the above-mentioned cross-cutting horizontal entrepreneurship activity, as these initiatives must be strongly linked to provide benefits to the downstream space community.

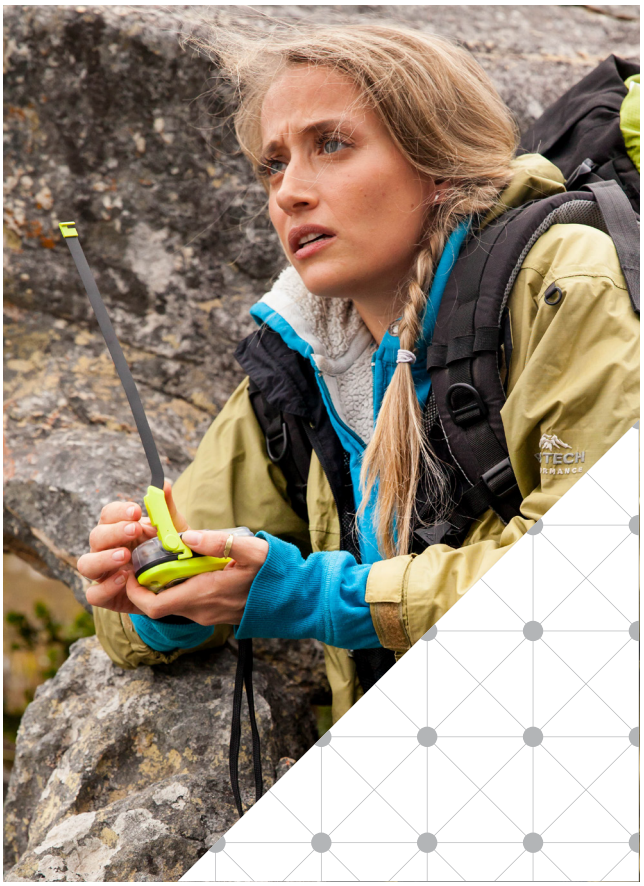
In Europe, there are several space-based R&D and application development competences, often with limited coordination between the different actors. In order to maximize the impact of R&D mechanisms and support the transfer of knowledge and the exchange of lessons learnt and best practices, the establishment of CoE/space hubs in strategic regions across the EU would be extremely useful. Such an initiative could attract local/national funding and also private investments.

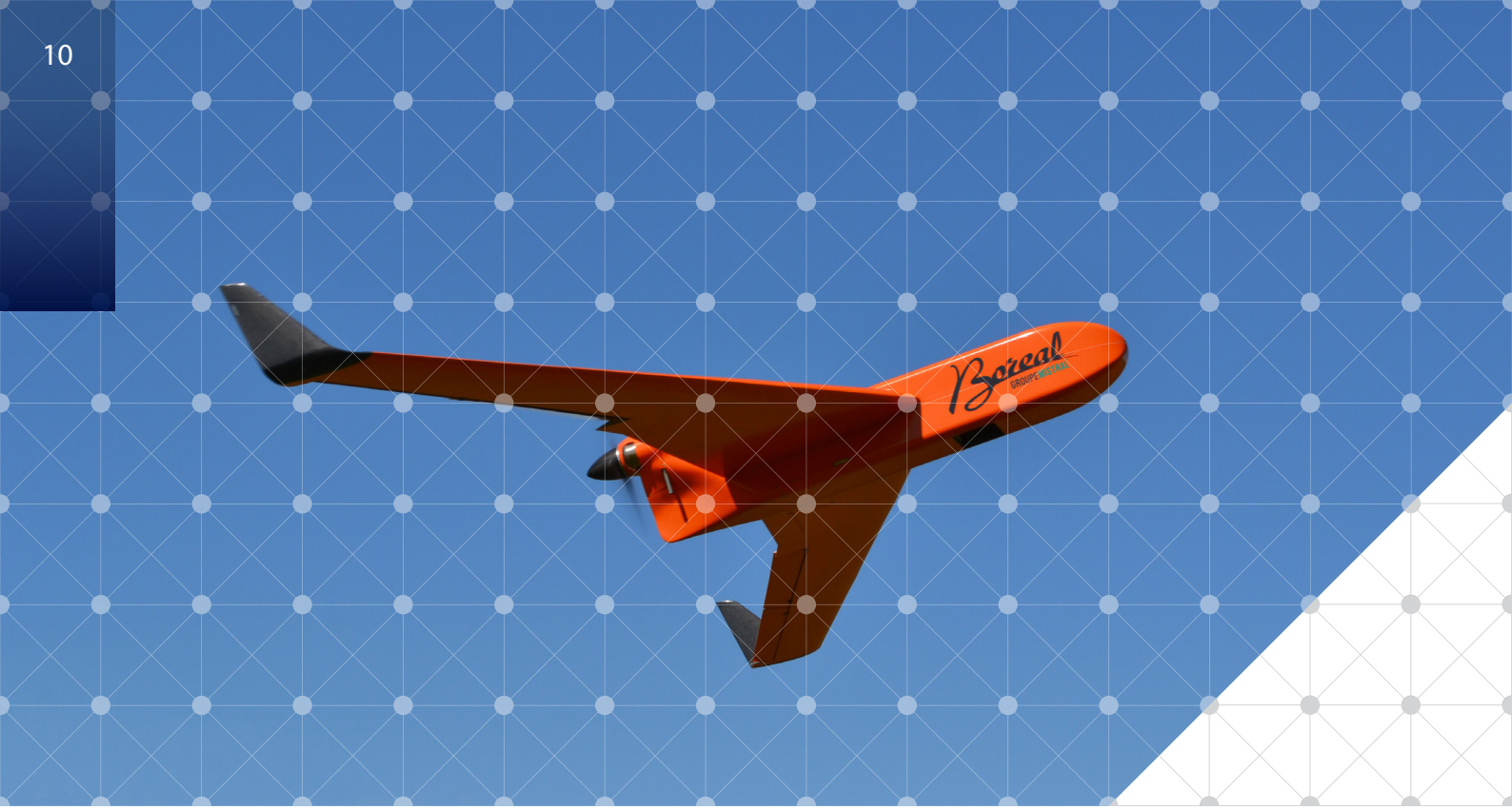
The aim of EGNSS CoE/space hubs is to improve expertise in specific downstream EGNSS/space related areas, and utilize resources to help a business improve towards an identified goal. One of the purposes of EGNSS/space hubs is to bring together a variety of different actors, and build up a community for downstream partnerships. It should provide a focal point for knowledge management, with the overall goal being to capture new knowledge and practices from inside and outside the organization, and establish best practices to disseminate to other actors.

The main goals of a EGNSS CoE/Space Hubs include:

- Provision of leadership and direction in the area of downstream applications
- Establishment and promotion of best practices between regions, provision of recommendations
- Realization of research and development activities
- Provision of business support to members of the CoE/space hubs in the form of training, consultancy and the sharing of trends and latest findings within the field of specific space-related domains, amongst others
- Support access to finance

The initiative should build on the existing excellences at regional/national levels on specific EGNSS-based applications. The CoE/space hubs should be established at the heart of an already existing cluster of business and institutional actors. R&D funds should support the initial set-up of the CoE/space hubs. However, following this initial stage, the CoE/space hubs should find a way to become operationally and financially stable.





KEY RECOMMENDATIONS:

1. **Secure the budget and scope** related to EGNSS downstream in the Space Regulation and Horizon Europe.

2. Significantly **increase the budget of Horizon Europe** in comparison to H2020 in order to **complete the uptake** in longer-term regulated market segments, to position Galileo as a leader in all segments where its differentiators make a difference, to support EU companies in exporting their innovation and products. An **increased budget** will also allow larger pilot projects and operational implementations of Galileo differentiators (e.g. Galileo High Accuracy in autonomous vehicles).

3. **Reshape Fundamental Elements,** as the main current objectives of the funding mechanism will have been met by 2020, with EGNSS receivers now appearing in most market sectors. The reshaped mechanism should **fill the gaps** in the development of EGNSS-enabled receivers and antennas, e.g. in **longer-term regulated segments** (enabling applications to be developed in Horizon Europe). Fundamental Elements will thereby focus on the **emerging Galileo differentiators** as they become operational, in order to facilitate **market readiness.**

4. Introduce **New Funding Tools** to cope with new needs that cannot be covered by the H2020 and Fundamental Elements tools as used until now (please refer to point above).

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